GE Medical Systems

Technical Publications

Direction 46−017226

Revision 5

Tube Ratings HRT 50 & 60 Hz

15° (262 mRad) Target Angle
Focal Spots: 0.75mm, 1.0mm, 1.25mm, 2.0mm

Model Numbers: Insert 46−125686
Housings 46−111159, 46−155750, 46−155700

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Operating Documentation

Direction 46−017226

Revision 5

Tube Ratings HRT 50 & 60 Hz

IMPORTANT! . . . X-RAY PROTECTION

X-ray equipment if not properly used may cause injury. Accordingly, the instructions herein contained should be thoroughly read and understood by everyone who will use the equipment before you attempt to place this equipment in operation. The General Electric Company, Medical Systems Group, will be glad to assist and cooperate in placing this equipment in use.

Although this apparatus incorporates a high degree of protection against x-radiation other than the useful beam, no practical design of equipment can provide complete protection. Nor can any practical design compel the operator to take adequate precautions to prevent the possibility of any persons carelessly exposing themselves or others to radiation.

It is important that everyone having anything to do with x-radiation be properly trained and fully acquainted with the recommendations of the National Council on Radiation Protection and Measurements as published in NCRP Reports available from NCRP Publications, 7910 Woodmont Avenue, Room 1016, Bethesda, Maryland 20814, and of the International Commission on Radiation Protection, and take adequate steps to protect against injury.

The equipment is sold with the understanding that the General Electric Company, Medical Systems Group, its agents, and representatives have no responsibility for injury or damage which may result from improper use of the equipment.

Various protective material and devices are available. It is urged that such materials or devices be used.

CAUTION: United States Federal law restricts this device to use by or on the order of a physician.

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If you have any comments, suggestions or corrections to the information in this document, please write them down, include the document title and document number, and send them to:

GENERAL ELECTRIC COMPANY
MEDICAL SYSTEMS

MANAGER − INFORMATION INTEGRATION − AMERICAS
W−622
P.O. BOX 414
MILWAUKEE, WI 53201−0414

CERTIFIED ELECTRICAL CONTRACTOR STATEMENT

All electrical installations that are preliminary to positioning of the equipment at the site prepared for the equipment shall be performed by licensed electrical contractors. In addition, electrical feeds into the Power Distribution Unit shall be performed by licensed electrical contractors. Other connections between pieces of electrical equipment, calibrations, and testing shall be performed by qualified GE Medical personnel. The products involved (and the accompanying electrical installations) are highly sophisticated, and special engineering competence is required. In performing all electrical work on these products, GE will use its own specially trained field engineers. All of GE's electrical work on these products will comply with the requirements of the applicable electrical codes.

The purchaser of GE equipment shall only utilize qualified personnel (i.e., GE's field engineers, personnel of third-party service companies with equivalent training, or licensed electricians) to perform electrical servicing on the equipment.

DAMAGE IN TRANSPORTATION

All packages should be closely examined at time of delivery. If damage is apparent, have notation "**damage in shipment**" written on **all** copies of the freight or express bill **before** delivery is accepted or "signed for" by a General Electric representative or a hospital receiving agent. Whether noted or concealed, damage **MUST** be reported to the carrier **immediately** upon discovery, or in any event, within **14** days after receipt, and the contents and containers held for inspection by the carrier. A transportation company will not pay a claim for damage if an inspection is not requested within this **14** day period.

Call Traffic and Transportation, Milwaukee, WI (414) 827−3449 / 8*285−3449 **immediately** after damage is found. At this time be ready to supply name of carrier, delivery date, consignee name, freight or express bill number, item damaged and extent of damage.

Complete instructions regarding claim procedure are found in Section "S" of the Policy & Procedure Bulletins.

6/17/94

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REVISION HISTORY

REV	DATE	REASON FOR CHANGE
0	Oct. 9, 1987	Initial release.
1	June 29, 1990	Add new catalog numbers for Mist Gray tube units. Make corrections to anode heat dissipation ratings and to fluoroscopic ratings.
2	June 19, 1992	Corrected temperature range for storage or shipment. Clarified anode heat storage capacity.
3	July 15, 1994	Made new table at bottom of Page 1. Eliminated 0.6 mm − 1.5 mm ratings.
4	Apr. 9, 1996	Added CE Marking statement.
5	Aug. 14, 1998	Added Tables 5 thru 8; removed MSI, MPX, MST generator setups.

LIST OF EFFECTIVE PAGES

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Title Page	5				
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1 thru 24	5				
Back Page	−				

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HRT TUBE UNITS

APPLICATION

Double focus, rotating anode for radiographic procedures.

FEATURES

- 275,000 heat unit anode heat storage capacity.
- 40,000 heat units per minute, maximum (peak) anode cooling rate.
- Polyrhenium™ specially processed rhenium-tungsten target surface.

HRT 09 TUBE UNIT

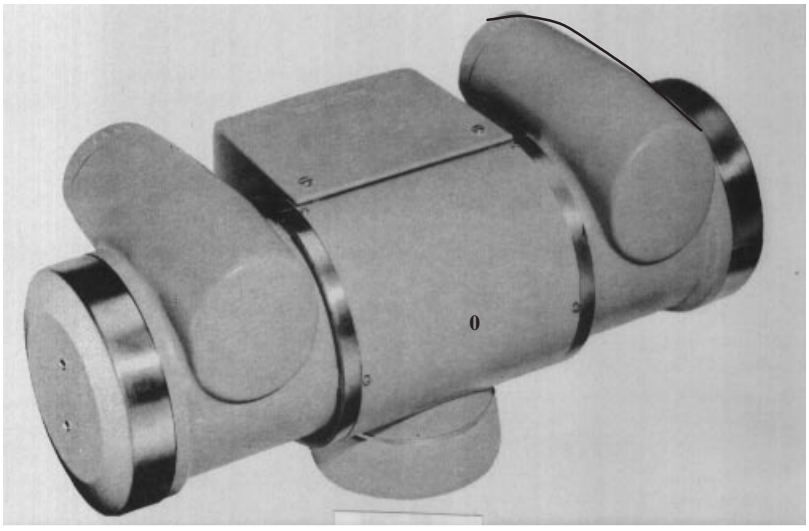


TABLE 1
SPECIFICATIONS

Note: Refer to appropriate insert data sheets to obtain the full unit data.

NEW TUBE UNIT(S)	EXCHANGE TUBE UNIT(S)	TUBE TYPE	SPEED	FOCAL SPOT	TARGET ANGLE	TYPICAL APPLICATION
46−155750G3/G203	46−155750G805	09N	LOW	1.0−2.0	15°	AMX−110, AMX−2
46−155750G5/G205	46−155750G806	09N	LOW	0.75−1.25	15°	AMX−3
46−155750G7/G207/G209	46−155750G804/G807	09N	LOW	0.75−1.25	15°	AMX−4, VMX
46−111159G56/G256	46−111159G803	09	LOW	1.0−2.0	15°	
46−155700G17/217	46−155700G802	18N	LOW	1.0−2.0	15°	

TABLE 2
KW RATINGS AT LOW SPEED 60 HZ
(0.1 SEC. EXPOSURE)

FOCAL SPOT	KW RATINGS 1 PHASE	KW RATINGS 3 PHASE (C.P.)
0.75	19.1	22.5
1.0	19.6	22.6
1.25	26.4	32.5
2.0	41.2	40.9

TABLE 3
X-RAY COVERAGE

TARGET ANGLE	SID IN. (CM)	FILM AREA MINIMUM IN. (CM)*
15° 15°	40 (101.60) 44 (111.76)	20.16 x 20.16 (51.21 x 51.21) 22.18 x 22.18 (56.34 x 56.34)

*MEASURED PER IEC SPECIFICATION

HRT TUBE UNITS

Tube Housing: Finish − mist gray smooth baked enamel. Shockproof housing constructed of aluminum. Lined with lead to minimize leakage radiation.

Oil expansion chamber permits fully rated operation in ambient temperature range from + 32°F to + 104°F (0°C to + 40°C) and permits storage or shipment at temperature range from −40° F to + 158° F (−40° C to + 70° C), and altitudes up to 20,000 feet (6096 meters).

Maximum voltage anode to cathode − kVp rectified 130 kVp.

Maximum voltage anode or cathode to ground − 65 kVp.

Amber indicating lamp installed in blower housing identifies selected tube unit prior to exposure initiation (most tube units).

Rating plates on housing lists focal spot sizes and serial numbers.

Minimum inherent filtration as follows:

Tube Housing − 0.3 mm aluminum at 130 kVp.
Tube Insert − 0.7 mm aluminum at 130 kVp.

Leakage technique factors for all housing assemblies are 130 kVp at 3.5 mA.

Tube Insert: Glass envelope facilitates “near” omni-directional heat radiation from target to the interior of the housing for improved heat dissipation.

Special anode and cathode design minimizes metal deposits.

Rotor bearing design allows longitudinal thermal expansion of shaft with no increase in friction.

Thermal Ratings: Heat Storage Capacity:

Anode − 275,000 heat units.

Tube Unit − 925,900 Joules (1,250,000 heat units)

Maximum Heat Dissipation Rate:

Peak Anode − 40,000 heat units per minute
Continuous Anode − 18,000 heat units per minute
Tube Unit − 20,000 heat units per minute

For single phase equipment, heat units equal kVp x mA x seconds.

For three-phase, 12−pulse equipment (or C.P.), heat units equal the product of kVp x mA x seconds x 1.35.

Internal oil circulation in the casing provides more uniform oil temperature for improved heat dissipation.

Tube Ratings:

Individual fluoroscopic and radiographic exposure limits govern allowable techniques until the heat storage capacity of the anode is reached. Thereafter, continued operation can be maintained only at the limit of the anode dissipation rate of 18,000 heat units per minute until the tube unit capacity of 1,250,000 heat units is reached. The input rate, including stator power, is then limited to 20,000 heat units per minute for the 09R, FLR housing.

Both the heat unit values shown for stator power and the heat unit values for exposures must be considered in calculating the average input rates for extended periods of operation.

The average energies attributable to stator power per exposure are as follows:

TABLE 4
AVERAGE ENERGIES

0−3,400 rpm	1,200 heat units	888 Joules
Continuous operation (fluoroscopy, normal speed)	8,000 heat units/minutes	99 Watts

Radiographic Ratings:

The tube rating charts are based upon a target temperature equivalent to 25% of storage (75% remaining). For heavy duty operation where this temperature is exceeded, 80% of the rating must be used.

Fluoroscopic Ratings:

Anode rotating or stationary. All focal spot sizes:

3.5 mA − 130 kVp
5.0 mA − 110 kVp
5.0 mA − 90 kVp

WEIGHTS (Approx.)

Net	Shipping
42 Lbs. (19 Kg)	62 Lbs. (28 Kg)

RELATED PUBLICATIONS Service Manual SM D1154

WARRANTY The published Company warranty in effect on date of shipment shall apply.

USER SERVICE The HRT Tube Unit requires no routine maintenance other than occasional cleaning of the external parts with a clean cloth. All major maintenance work, including tube replacement, should be done only by qualified personnel.

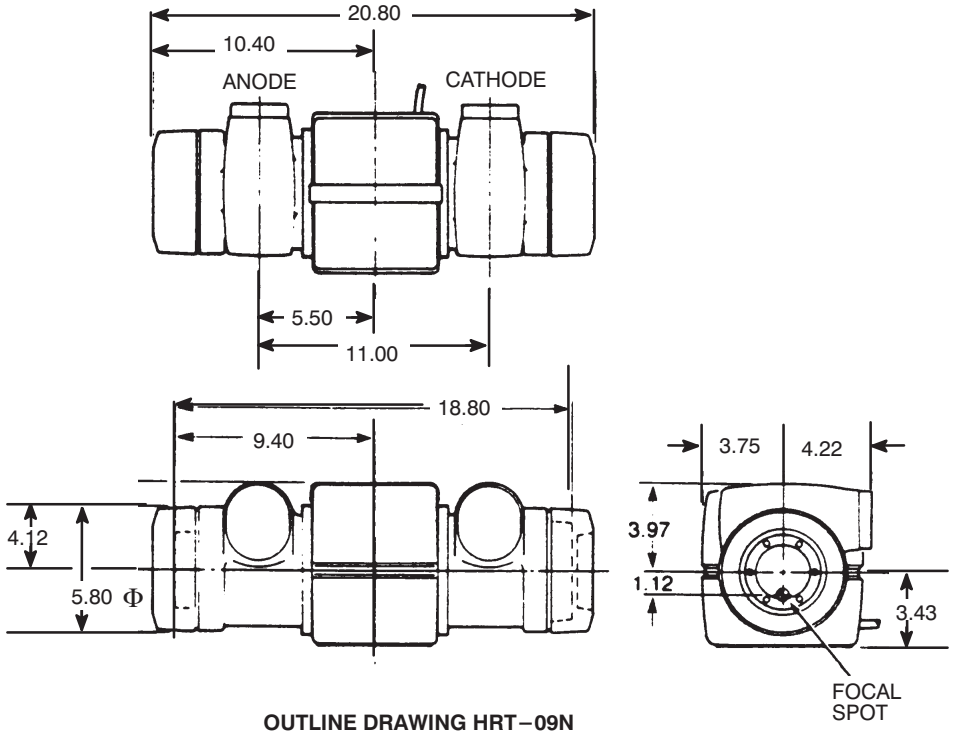
UL and CSA LISTINGS

UL Listed − CSA Listed
This product has been designed to meet applicable performance standards for diagnostic x-ray equipment as enunciated by CFR 21 Subchapter J.

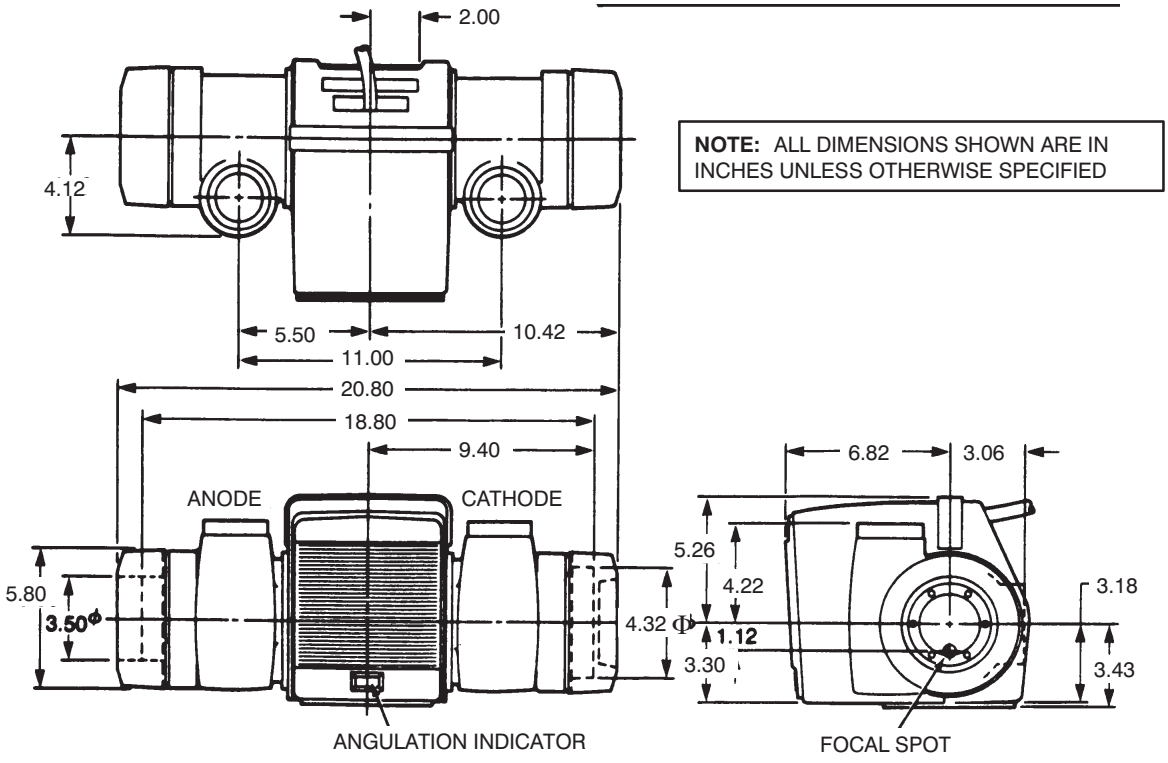
Note:

This X−Ray Tube Unit Assembly is intended to be installed in a GE X−ray apparatus that may or may not be CE Marked. Installing a CE Marked X−Ray Tube Assembly in a non−CE Marked system does not make the whole system CE Marked.

Refer to the X−ray system documentation for X−ray tube unit assembly compatibility and for system CE Marking information.

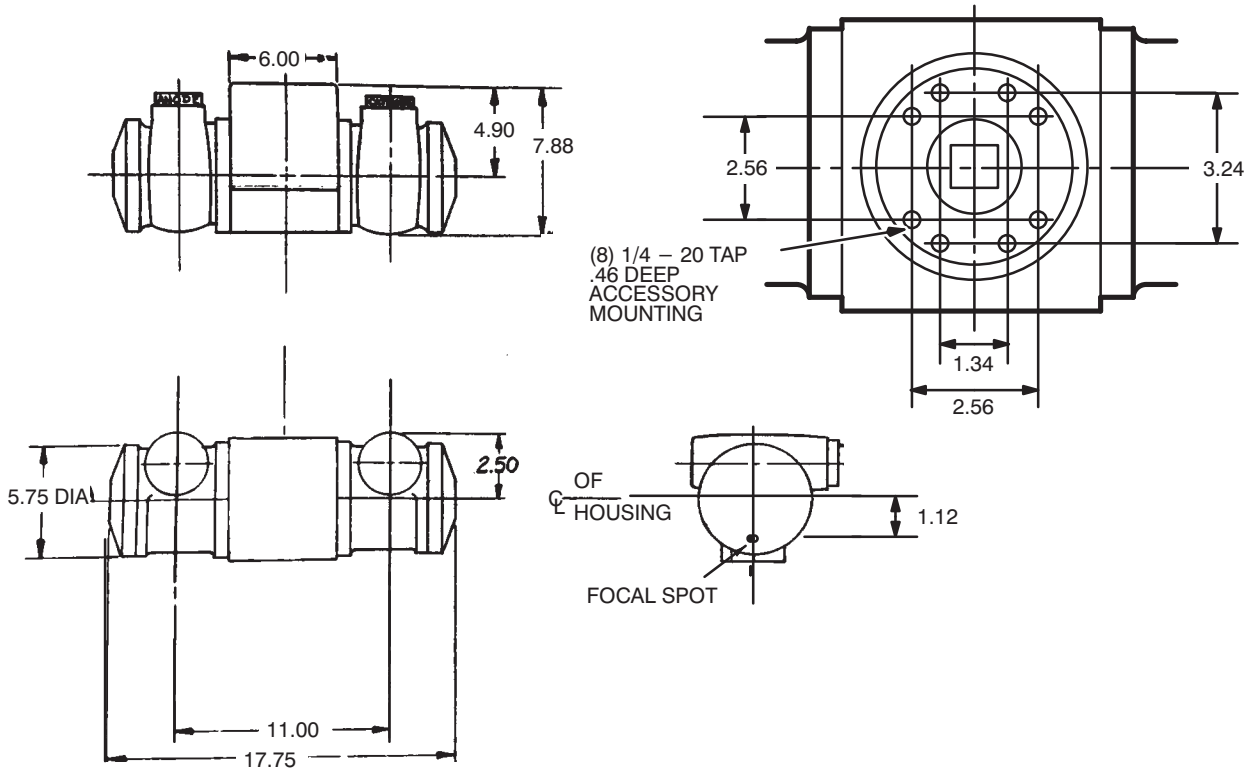


OUTLINE DRAWING HRT−09N

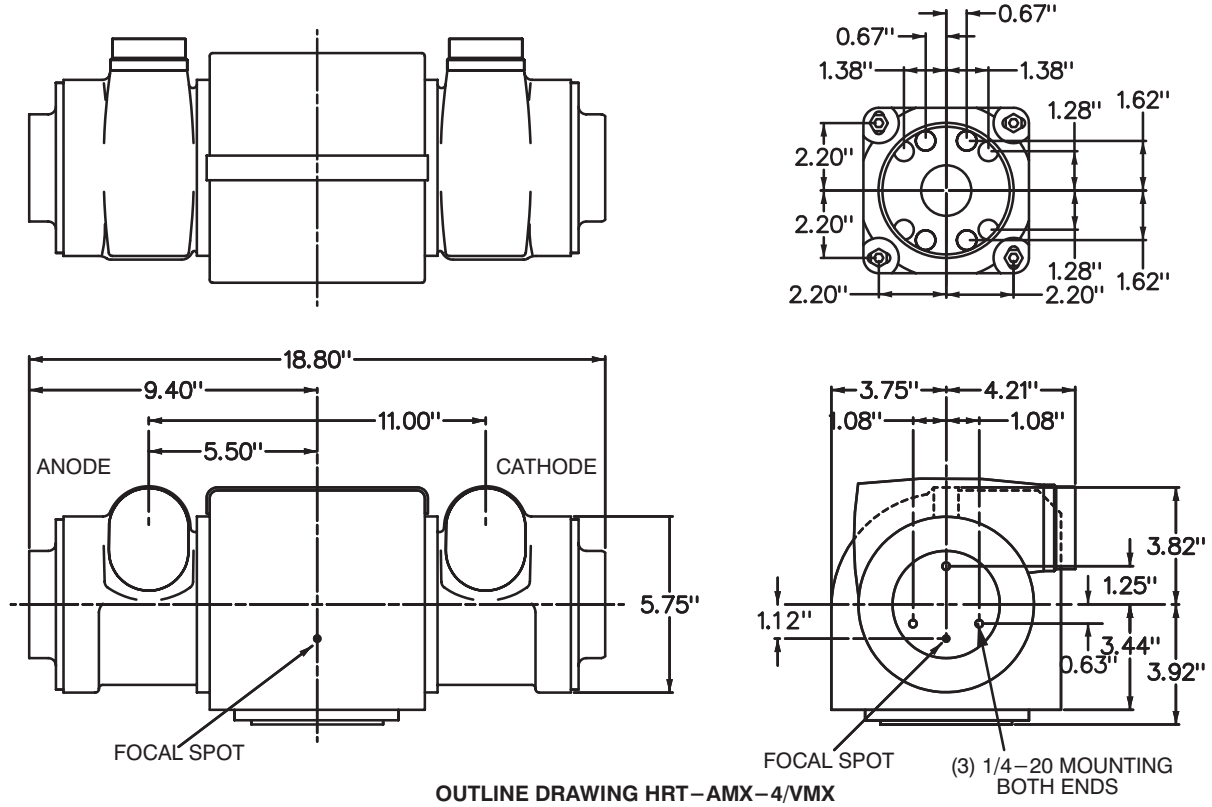


NOTE: ALL DIMENSIONS SHOWN ARE IN INCHES UNLESS OTHERWISE SPECIFIED

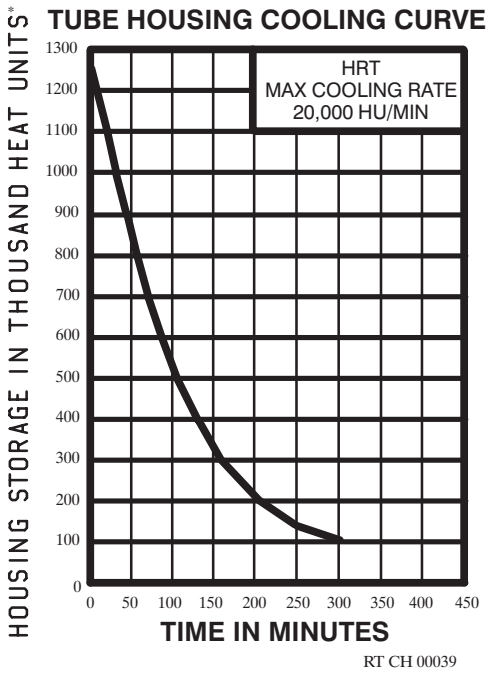
OUTLINE DRAWING HRT−18, 18N

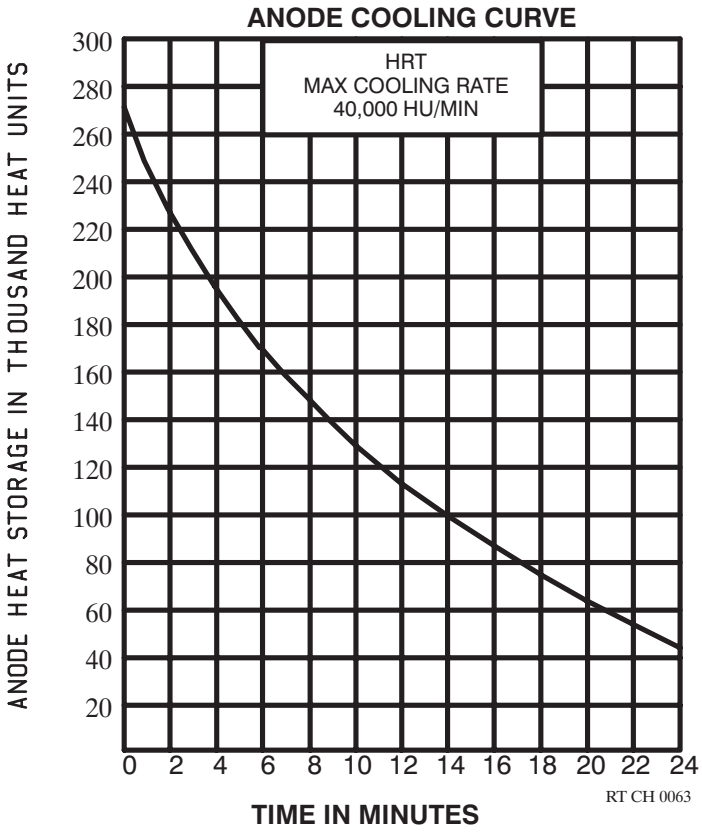


OUTLINE DRAWING HRT−09



OUTLINE DRAWING HRT−AMX−4/VMX





*See Page 3 for single phase and three phase formulas for calculating heat units.

X−RAY TUBE CONDITIONING

These charts are based upon a target temperature equivalent to 25% of storage (75% remaining). For heavy-duty operation where this temperature is exceeded, 80% of the rating must be used.

Warm−Up Procedure

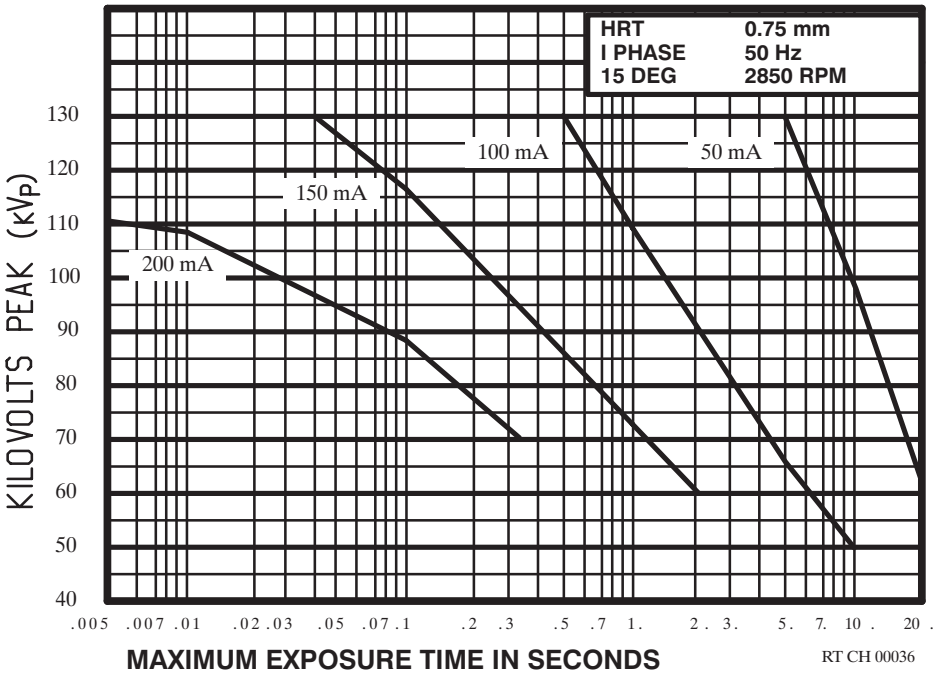
The first exposures of the day or following several hours shutdown should be made at a MEDIUM POWER level rather than at voltages or currents near maximum ratings. A medium power exposure will test the system for normal function with a minimum risk of damaging the tube or transformer in the event of a component failure. The following technic may be used with due regard to radiation protection of all personnel.

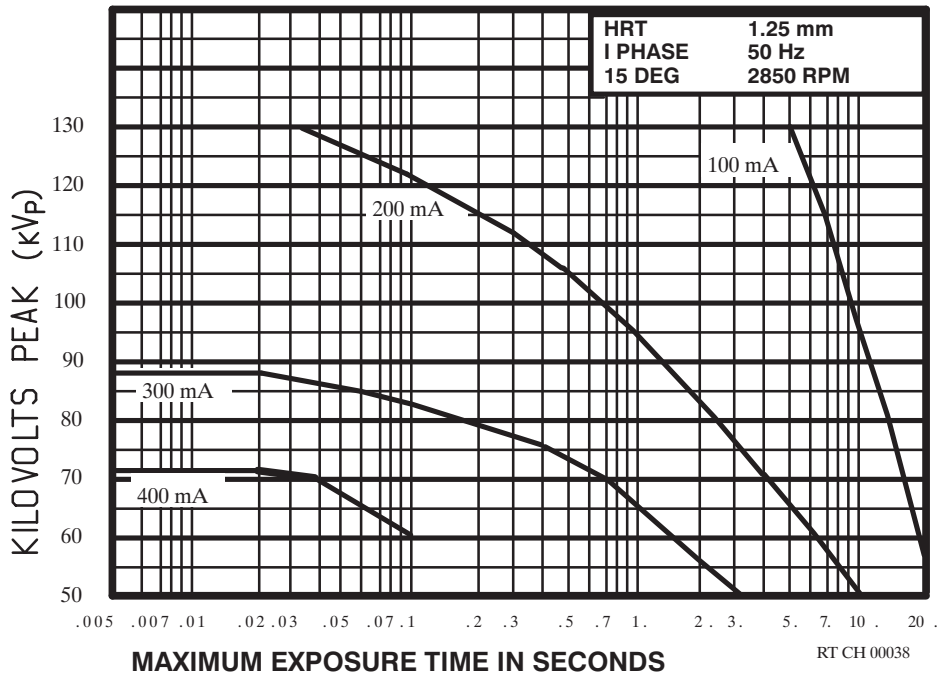
For AMX & VMX Mobile Units:
4 Exposures 30 Seconds Apart
Small Focal Spot
80 kVp
100 mAs per Exposure

For Other X−Ray Generators:
2 Exposures 30 Seconds Apart
Large Focal Spot at lowest mA station
80 kVp
200 mAs per Exposure

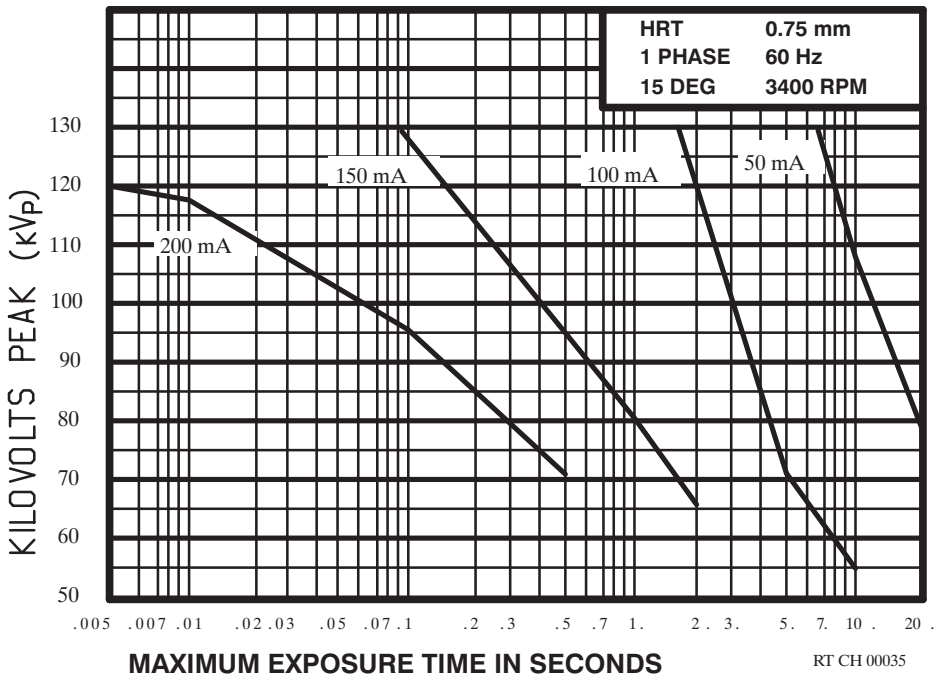
Note: For maximum tube filament life, do not leave a high mA station selected for extended periods of time.

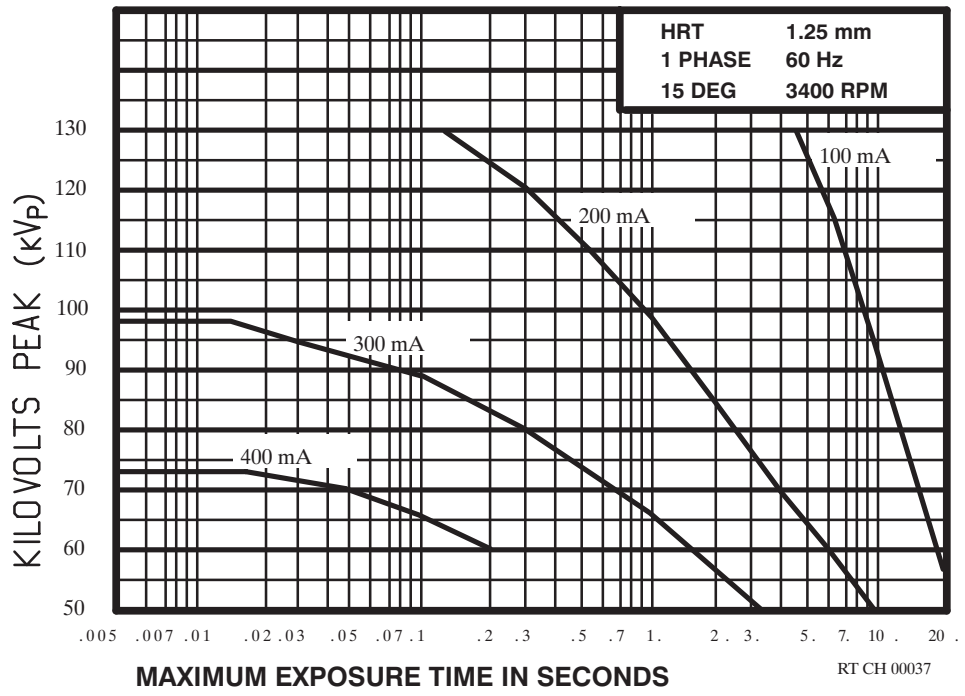
RADIOGRAPHIC TUBE RATINGS
0.75, 1.25 mm 15° (262 mRAD)
1 PHASE, LOW SPEED, 50 Hz





RADIOGRAPHIC TUBE RATINGS
0.75, 1.25 mm 15° (262 mRAD)
1 PHASE, LOW SPEED, 60 Hz





RADIOGRAPHIC TUBE RATINGS
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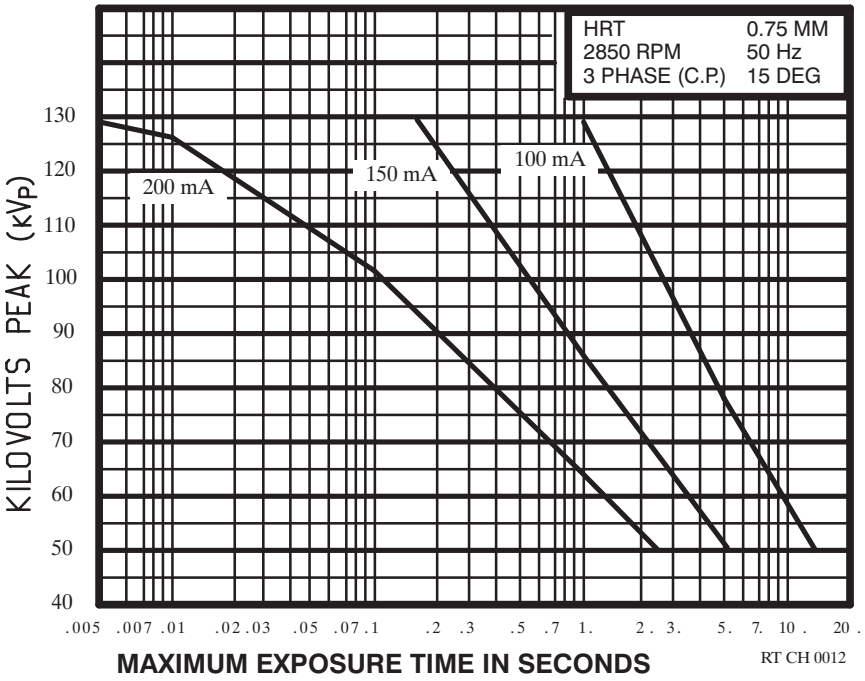
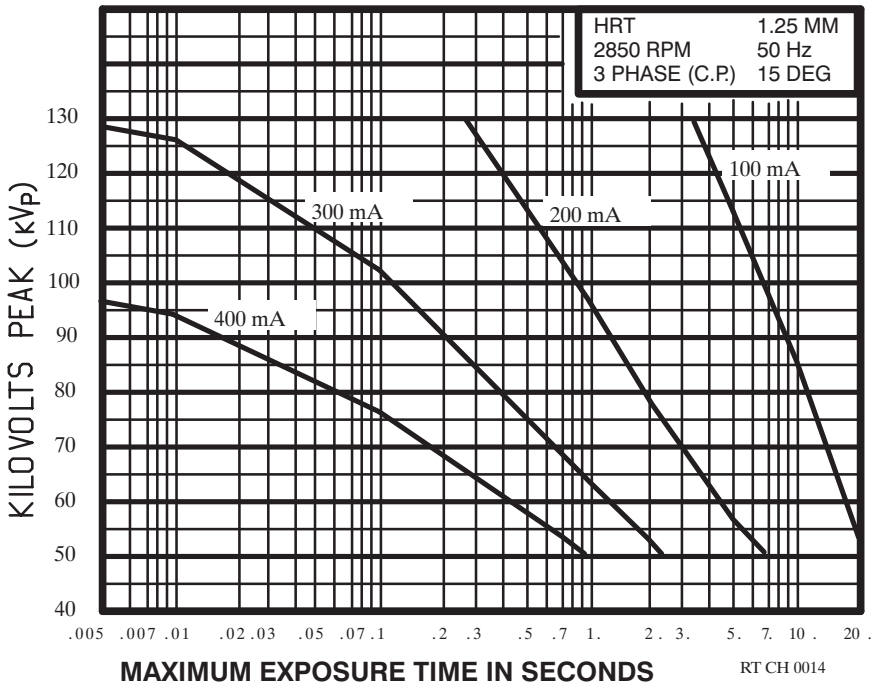
3 PHASE (C.P.), LOW SPEED, 50 Hz





RADIOGRAPHIC TUBE RATINGS
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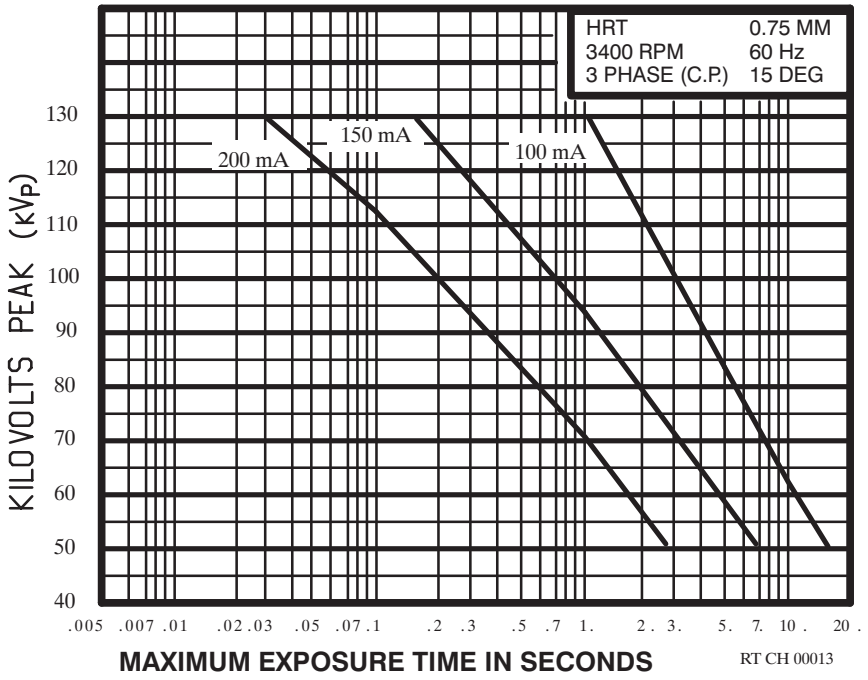
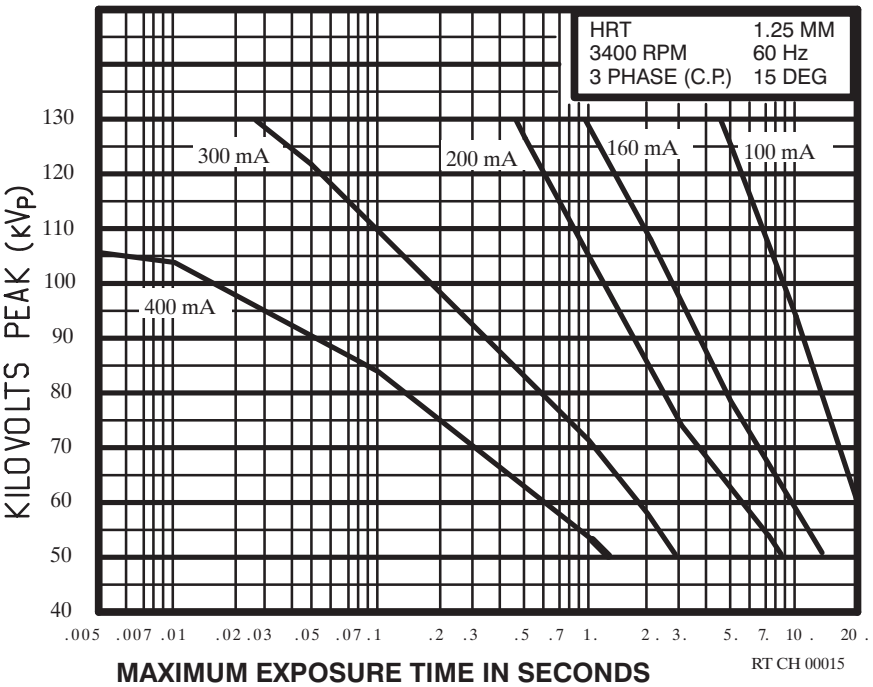
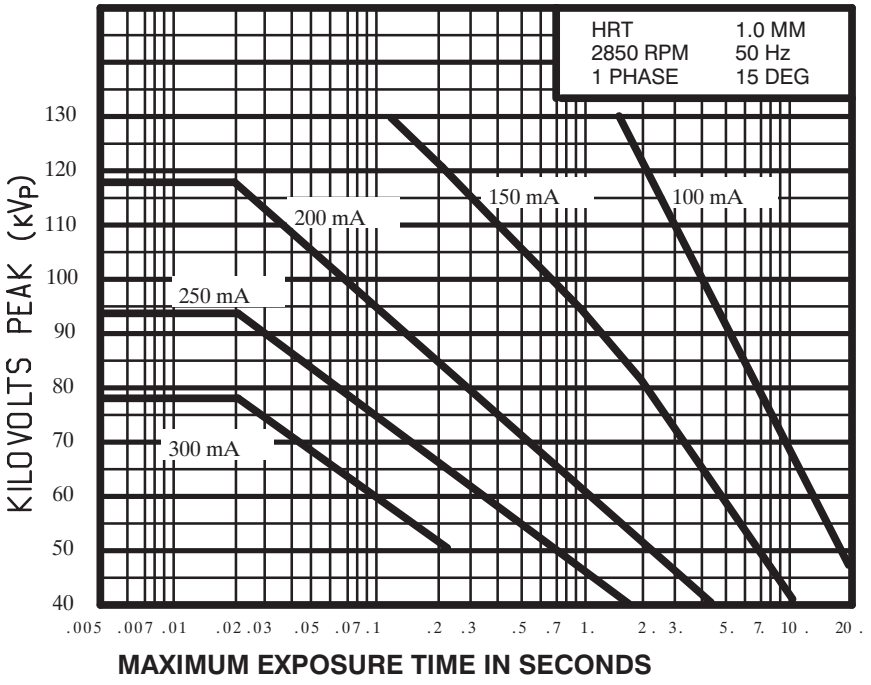
3 PHASE (C.P.), LOW SPEED, 60 Hz

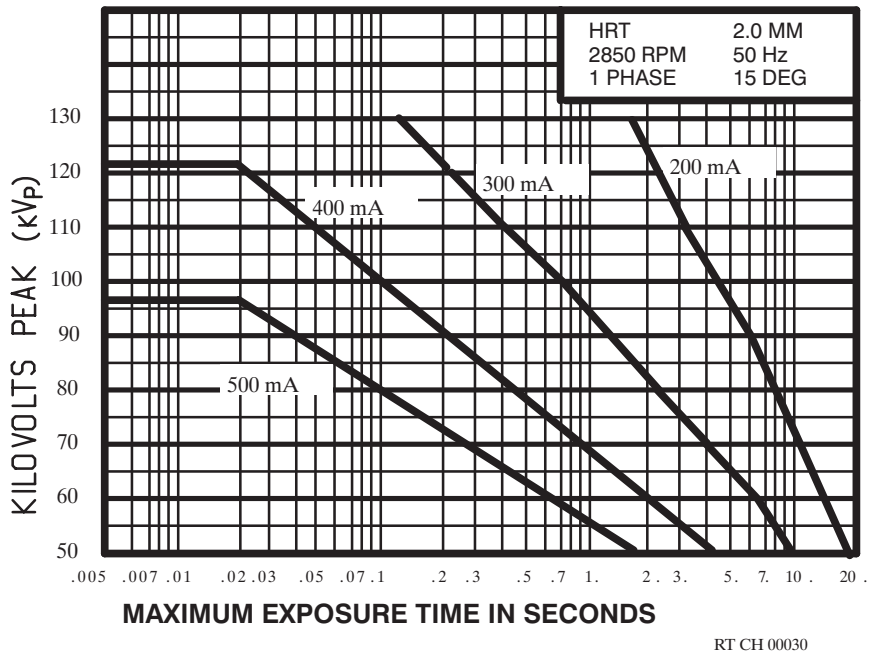




RADIOGRAPHIC TUBE RATINGS
1.0, 2.0 mm 15° (262 mRAD)
1 PHASE, LOW SPEED, 50 Hz



RT CH 00028



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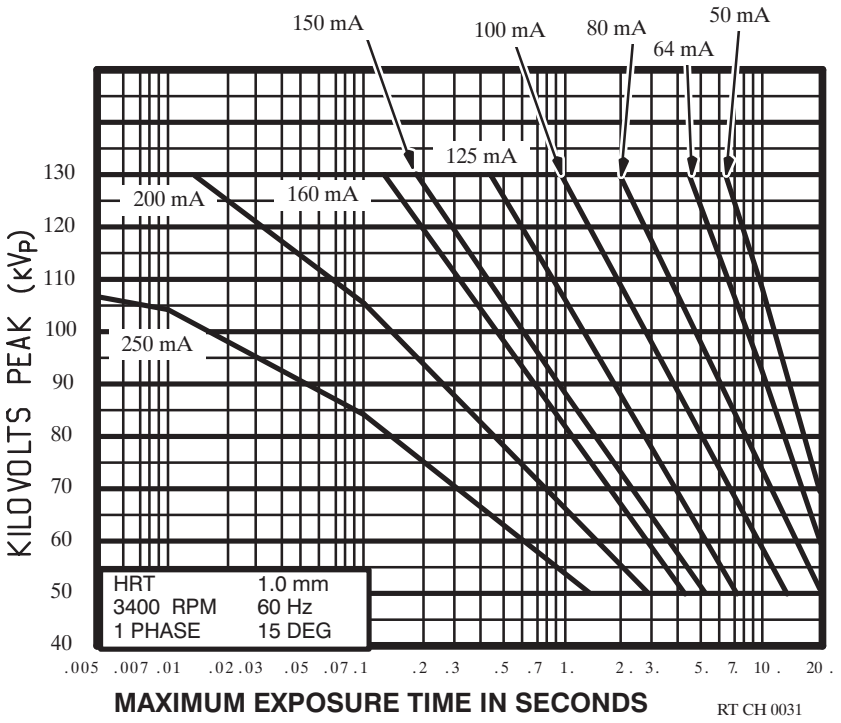
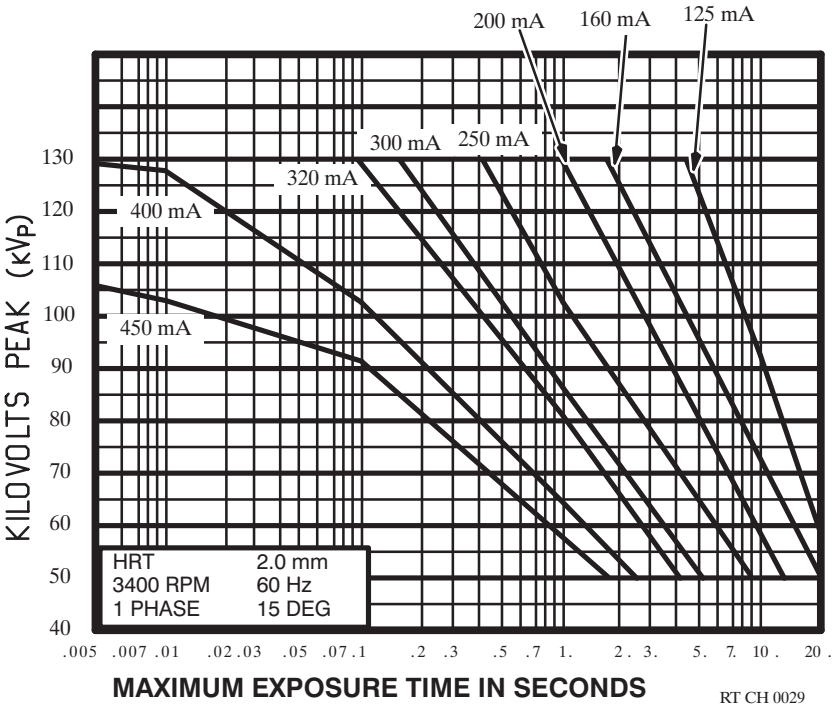
1 PHASE, LOW SPEED, 60 Hz





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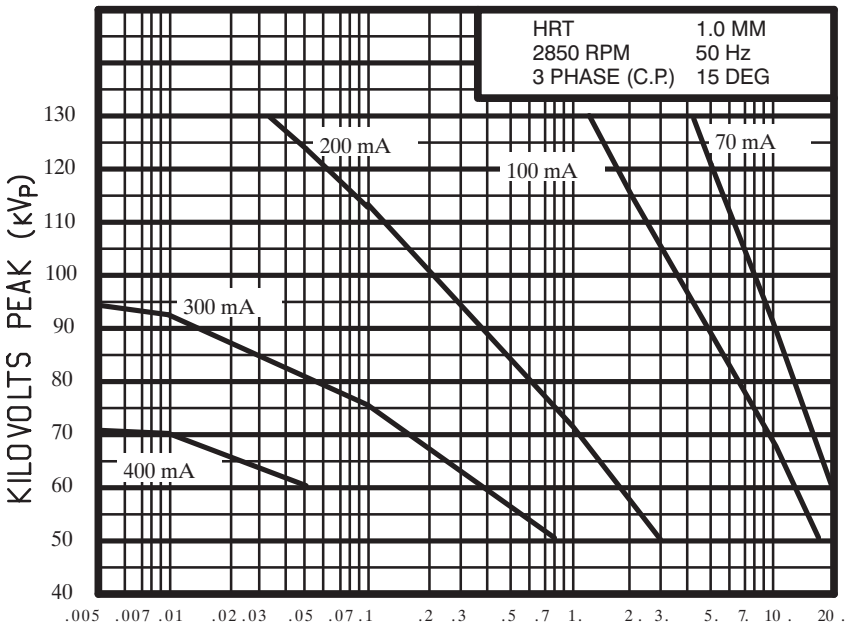
1.0, 2.0 mm 15° (262 mRAD)
3 PHASE (C.P.), LOW SPEED, 50 Hz



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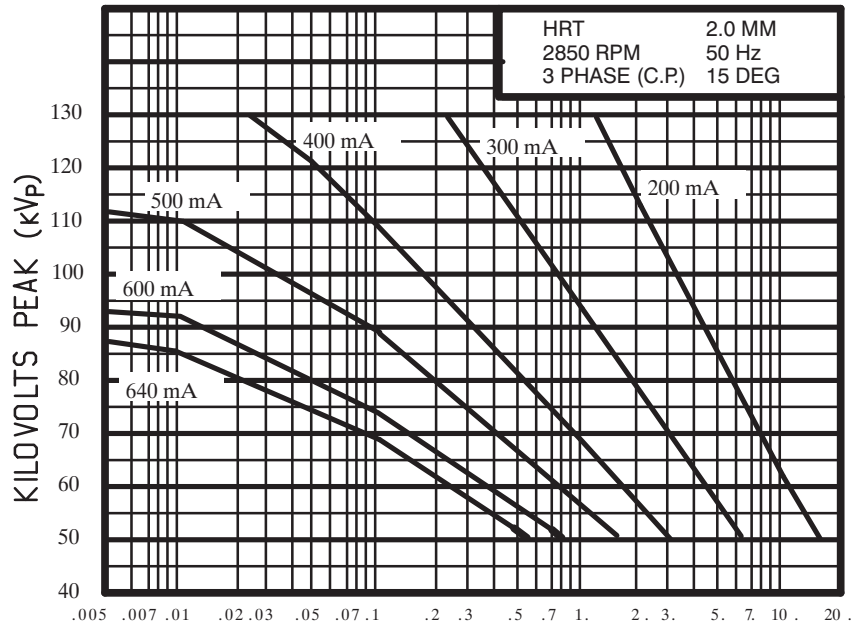

RT CH 00012

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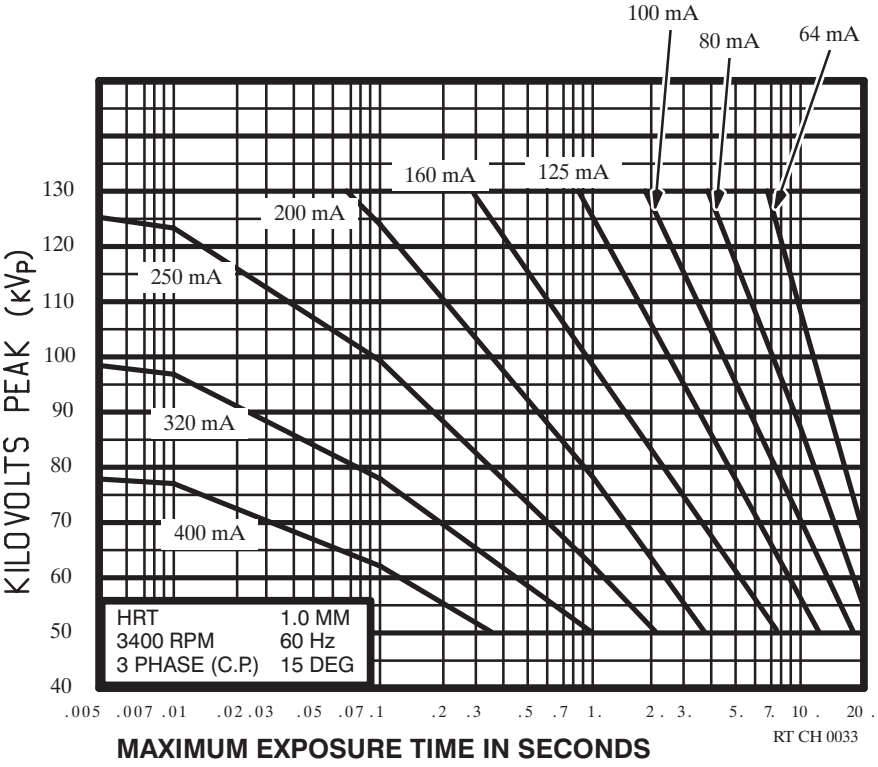
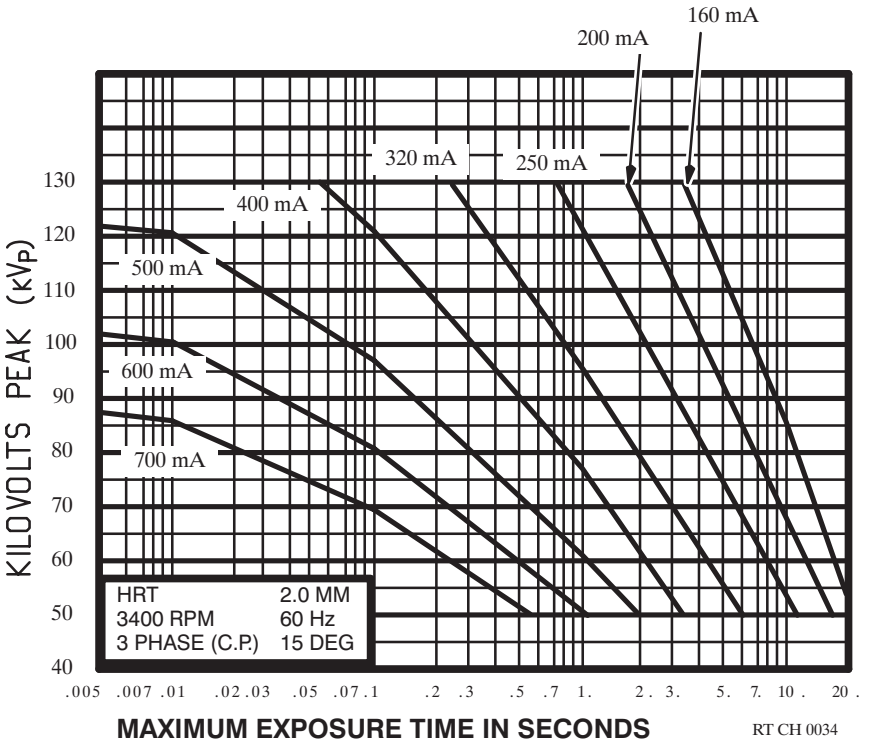
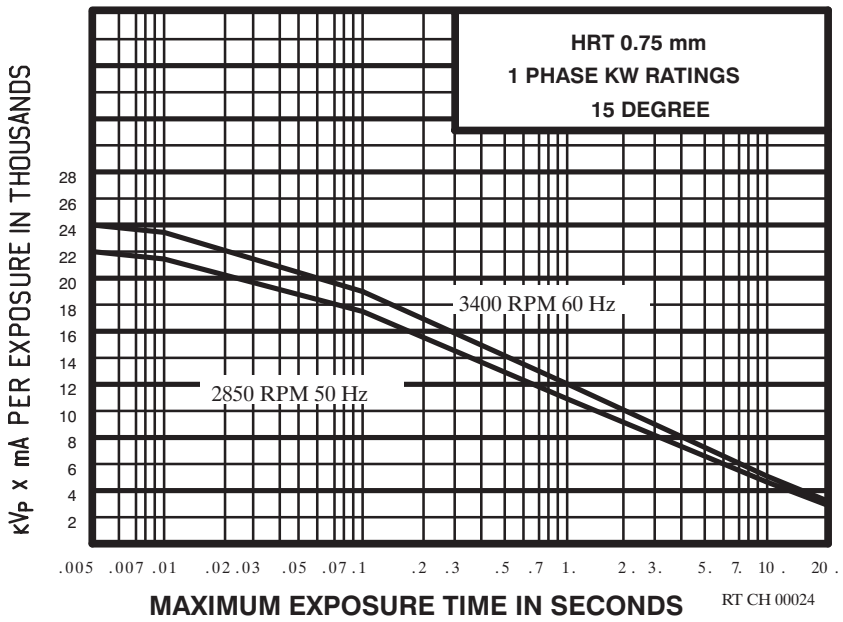




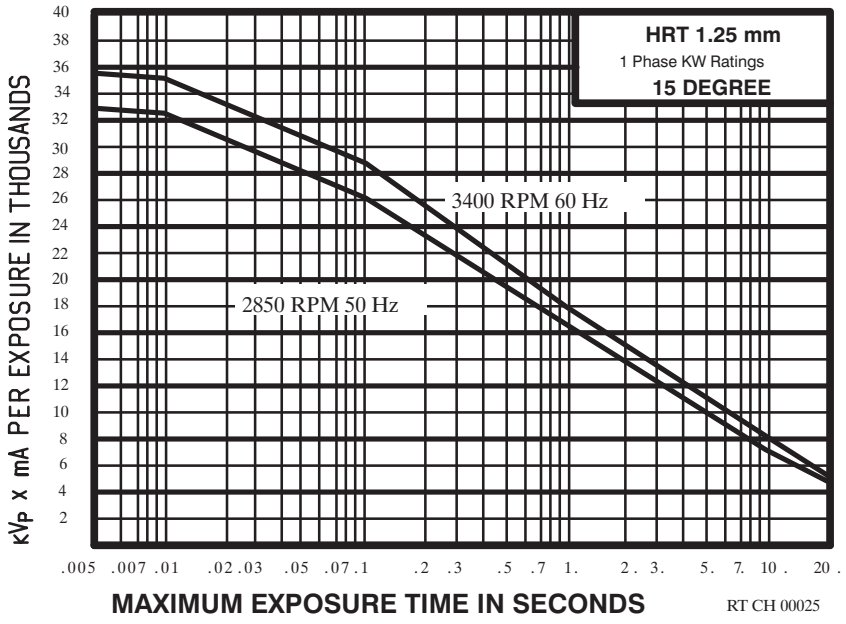
1 PHASE kW RATINGS
0.75, 1.25 mm 15° (262 mRAD)

SPOT SIZE

0.75 mm



1.25 mm



3 PHASE (C.P.) kW RATINGS
0.75 mm 15° (262 mRAD)

SPOT SIZE

0.75 mm

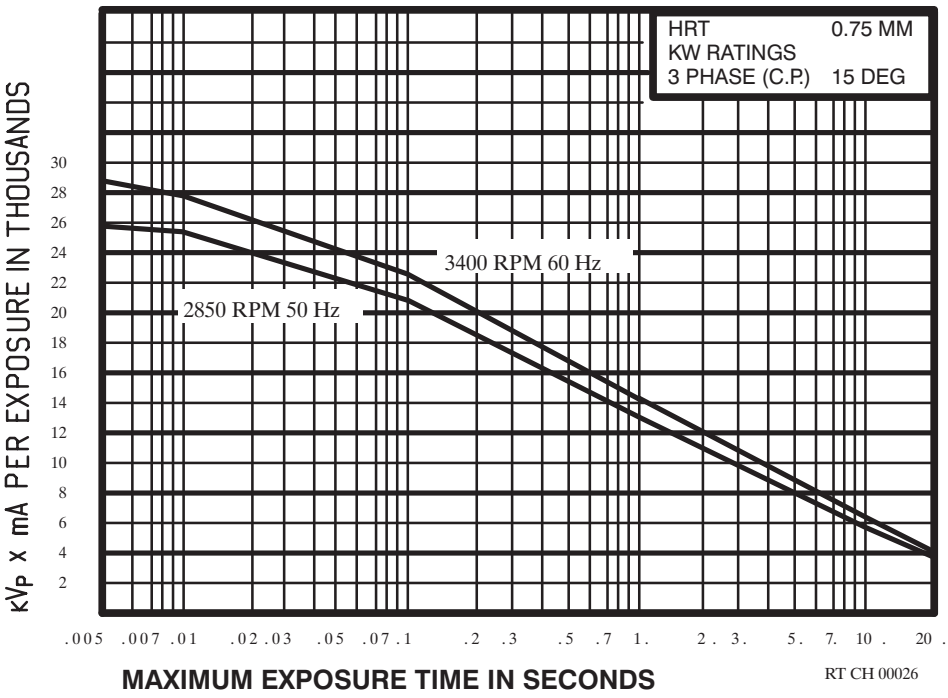


TABLE 5
FOCAL SPOT SINGLE LOAD RATING 0.75 MM FOCAL SPOT

EXPOSURE TIME (S)	POWER (KW)
0.01	28
0.1	22.5
1	14.1
10	6.1

3 PHASE (C.P.) kW RATINGS
1.25 mm 15° (262 mRAD)

SPOT SIZE

1.25 mm

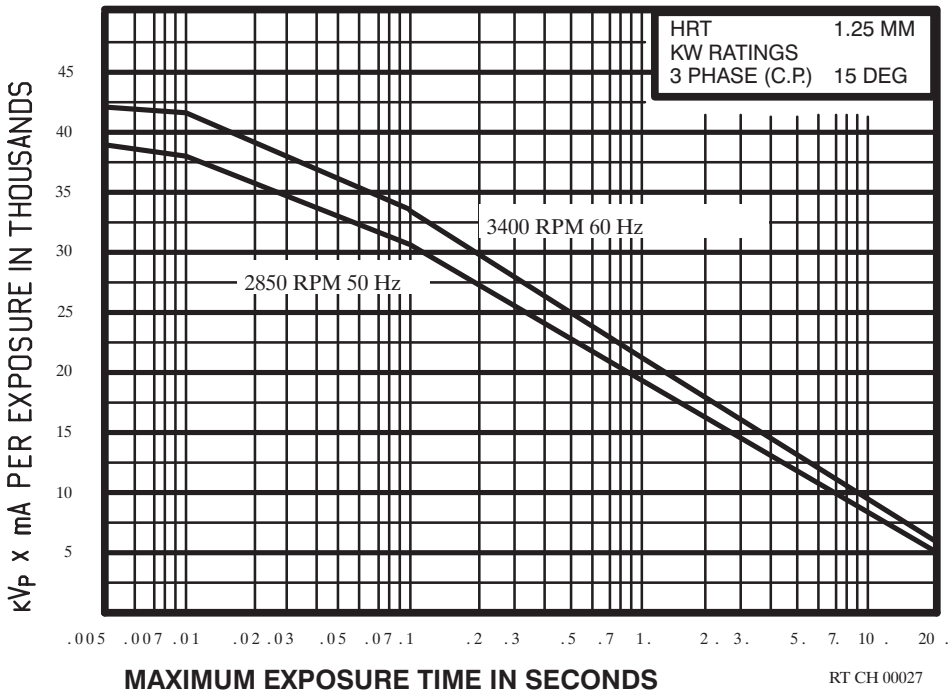


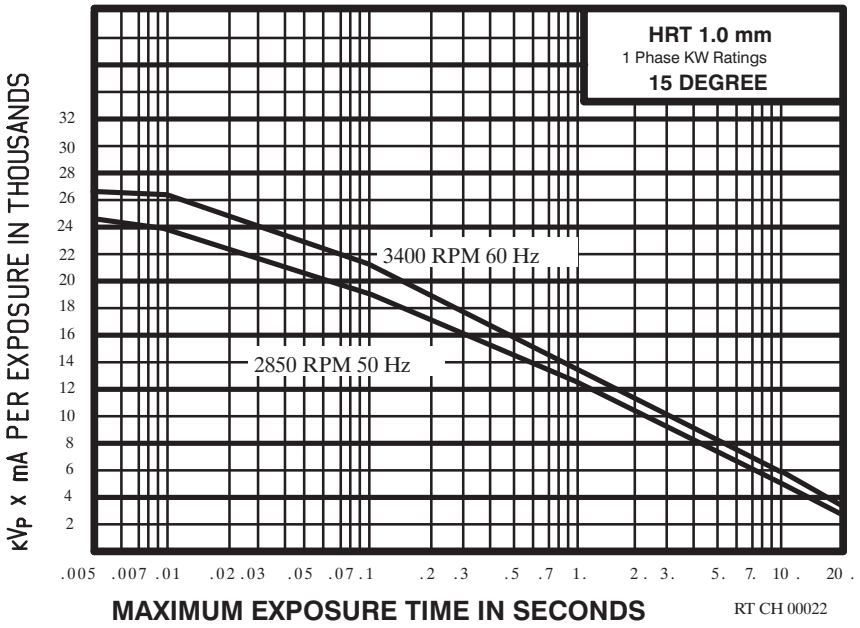
TABLE 6
FOCAL SPOT SINGLE LOAD RATING 1.25 MM FOCAL SPOT

EXPOSURE TIME (S)	POWER (KW)
0.01	42
0.1	32.5
1	20.3
10	9.9

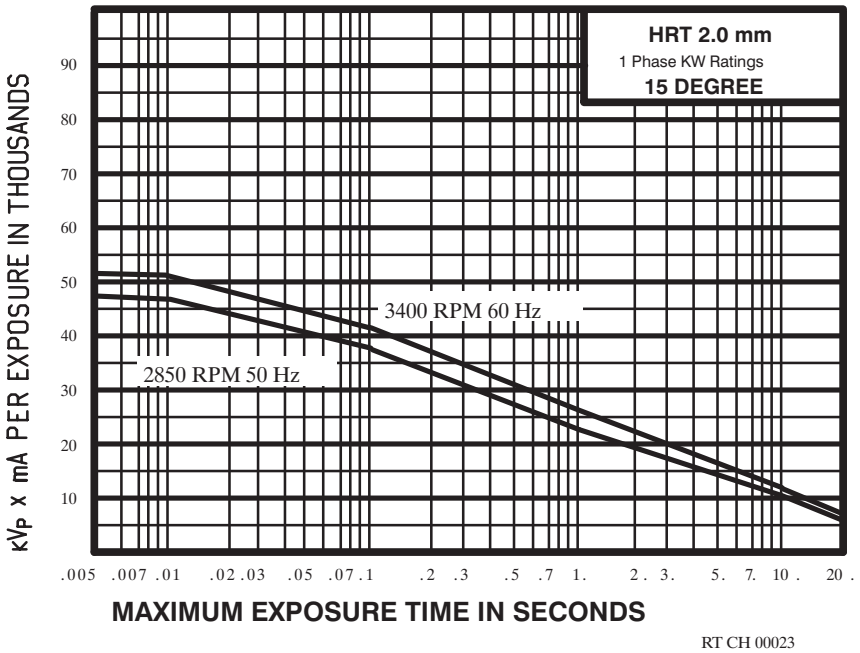
1 PHASE kW RATINGS
1.0, 2.0 mm 15° (262 mRAD)

SPOT SIZE

1.0 mm



2.0 mm



3 PHASE (C.P.) kW RATINGS
1.0 mm 15° (262 mRAD)

SPOT SIZE

1.0 mm

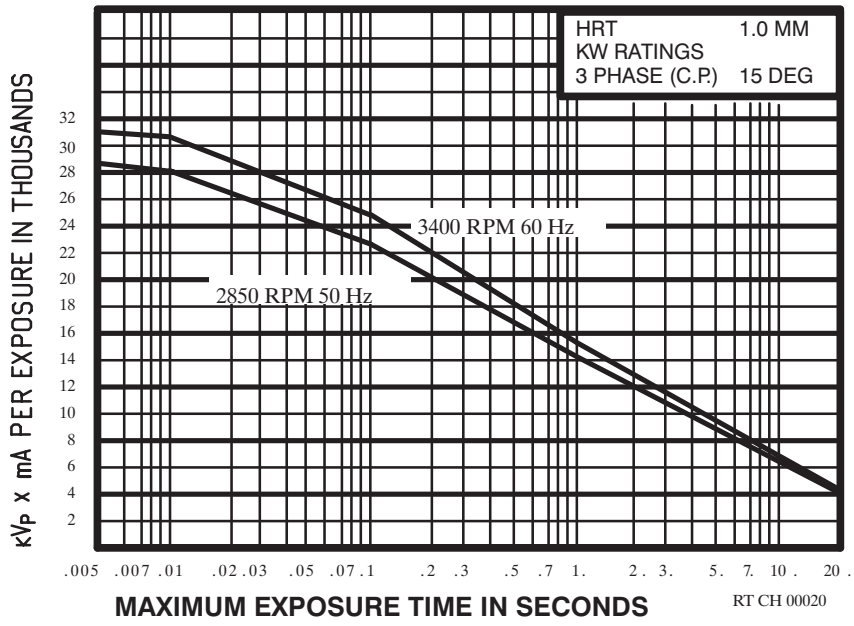


TABLE 7
FOCAL SPOT SINGLE LOAD RATING 1.0 MM FOCAL SPOT

EXPOSURE TIME (S)	POWER (KW)
0.01	31.1
0.1	24.4
1	15.6
10	6.5

3 PHASE (C.P.) kW RATINGS
2.0 mm 15° (262 mRAD)

SPOT SIZE

2.0 mm

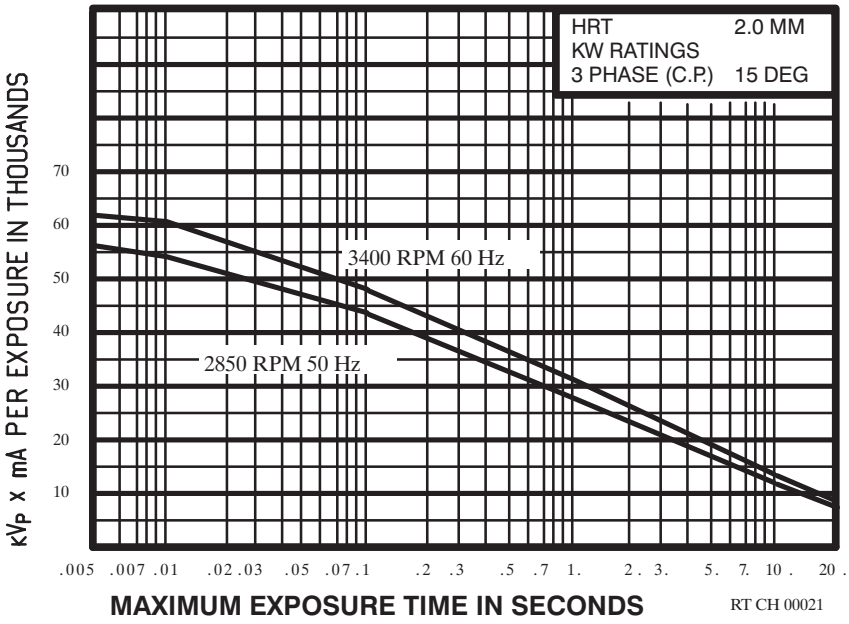


TABLE 8
FOCAL SPOT SINGLE LOAD RATING 2.0 MM FOCAL SPOT

EXPOSURE TIME (S)	POWER (KW)
0.01	51.5
0.1	40.9
1	26.2
10	12

HRT TUBE FILAMENT RATINGS

TABLE 9
HRT RATINGS

FILAMENT (MM)	AMPERES	VOLTS
1.0	4.5−5.4	5.5−9.0
2.0	3.5−5.6	9.0−14.0
.75	3.5−5.5	2.0−4.5
1.25	3.5−5.5	3.8−8.5

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GE Medical Systems

GE Medical Systems: Telex 3797371
P.O. Box 414, Milwaukee, Wisconsin 53201 U.S.A.
(Asia, Pacific, Latin America, North America)

GE Medical Systems — Europe: Telex 698626
283, rue de la Miniére, B.P. 34, 78533 Buc Cedex
France